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ABSTRACT

This report documents the design, development, and implementation of computer applications curricula in a pilot program augmenting the regular curriculum for eighth graders at a private middle school. In assessing the needs of the school, a shift in focus was made from computer programming to computer application. The basic objectives of the course included identifying basic components of the computer system, learning basic computer terminology, and performing basic computer, word processing and graphics functions. A brief history of computers and a description of ethical issues of computer usage were added at the request of the school administration. A hands-on approach was chosen for most of the instruction, using criterion referenced assessment of learner competencies. Results of the evaluation of the program revealed five strengths and three weaknesses and concluded that: (1) computer literacy at an early age gives learners access to a very powerful tool; (2) a course to upgrade keyboarding skills would be a valuable prerequisite to computer instruction; (3) the teaching of computers as a separate, non-integrated subject does not tap the potential of integrating computers into other curricular areas; and (4) teachers and teacher educators must be better educated in the use of computers to assist in instructional and administrative functions. (Contains 8 references.) (ALF)

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Design, Development and Implementation of a Middle School Computer Applications Curriculum

Presentation of a Program Description Report
at the Annual Conference of
the Arizona Educational Research Organization
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by

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Design, Development and Implementation of a Middle School Computer Applications Curriculum

Introduction

Computer curriculum, once a domain of specialized college and technical education, is being introduced to increasingly younger learners each year. Integration of computers into the elementary school curricula brings almost certain challenges and often necessitates paradigm shifts, but also provides possibilities of great rewards for students and teachers alike.

This paper is a report documenting the design, development, and implementation of computer applications curricula for a private middle school. The concepts discussed in this paper should, however, be useful for public schools that wish to introduce or amplify computer instruction in their curricula.

History of the project

During the 1989-90 school year, administrators of a private middle school in Provo, Utah, decided to augment the following year's curriculum by offering a course in computer literacy. A pilot program was to be developed and implemented to the eighth grade population of the school. If successful, the program would become a part of the normal school curriculum and would be expanded to include both seventh and eighth grades.

The school's administration contacted Dr. Paul Merrill, Department Chair of Instructional Science at Brigham Young University's College of Education. Dr. Merrill was asked to provide a graduate intern who could direct the formulation of curricular objectives, design the course instruction, and teach

the pilot course. Dr. Merrill selected Anthony Piña, graduate instructor for the preservice teacher computer literacy courses at B.Y.U., to develop and teach the pilot program.

Since the school did not have its own computers to use in the implementation of this project, a partnership was established between the school administration and the Department of Instructional Science. The school would have access to the Instructional Science Computer Laboratory every weekday during the hour preceding its normal operating hours.

Formulation of curricular objectives

The first stage of the project was to assess the needs of the school and formulate goals and objectives for the computer course. Although most of the available computer science curriculum was geared toward developing programming skills, the result of the needs assessment was a shift in focus from computer programming to computer applications. Word processing skills and basic computer operations were assigned the highest priority.

The initial basic objectives formulated for the project are listed in Table 1. These objectives were validated by a professor of instructional design and the chief administrator of the school. Other objectives, such as describing a brief history of computers, and describing the ethical issues of computer usage, were added at the request of the administration in order to fulfill computer merit badge requirements for the Boy Scouts enrolled in the class.

Table 1: Basic Objectives of Computer Applications Course

Identify the basic components of the computer system

- Keyboard
- Monitor
- Disk drives
- Central processing unit
- Mouse
- Printer

Identify basic computer terminology

- Mainframe computers, minicomputers, and microcomputers
- Input and output devices
- Hardware and software
- RAM and ROM
- Bits, bytes, kilobytes and megabytes

Perform basic computer functions

- Start up the computer
- Load software programs
- Run software programs
- Save data to hard and floppy disks
- Copy files
- Format floppy disks
- Alter computer environment with the control panel

Perform basic word processing functions

- Cut and paste text
- Alter margins of documents
- Bold and underline text
- Select and change text fonts
- Change the justification of text
- Spell-check documents
- Save documents
- Alter tables
- Change line spacing
- Generate page numbers

Perform basic graphics and drawing functions

- Perform pointing and clicking functions with a mouse
- Retrieve and modify graphic images
- Use mouse for free hand drawing and generation of geometric shapes, lines, and fills

Strategies for instruction

The course was designed for "hands on" instruction. Learners spent the majority of the instructional time practicing basic computer and word processing functions on IBM PS/2, Macintosh, and Apple II computers. Graphics functions were limited primarily to the Macintosh. Software utilized included WordPerfect 5.1, Microsoft Works 2.0, Appleworks 2.0, MacWrite 2.0, MacPaint, SuperPaint, and Hypercard 2.0.

Various instructional strategies were utilized during this project, in order to simulate conditions in schools where computer access is limited. These strategies included computer-assisted instruction for small and large groups, role playing, learning through discovery, analogies, field trips, and lecture. Instructional media used for the project included hypermedia-based presentations, liquid-crystal display (LCD) screens, overhead transparencies, pictures, and computers, which were opened up to reveal their components.

Assessing learner competencies and instructional quality

The school administration allowed the use of criterion-referenced assessment learner competencies for the project. Examinations and instructional content were based completely on the curricular objectives, in an effort to avoid the "teach them 'A' but test them 'B'" syndrome. With one exception, all examinations were directed performance tests. Learners would perform tasks on the computer as directed by the instructor, who would evaluate the degree to which the task had been performed

correctly. The one exception was a written test on computer terminology given during the second week of class. A student who scored poorly on one part of the exam was given a chance to retake the exam at a later date.

The purpose of the examinations was to assess the quality of instruction, as well as the ability of the learners to perform at a level of competency. If a significant number of students were not able to perform a specific examination task, instruction was then altered and the learners were retested on the task.

Results

Although most of the students were comfortable around computers when the class started, their previous experience consisted of video and computer games, rather than word processing or graphics work. Of the 16 students in the pilot class, 14 scored above the 90% mark, thus earning a grade of "A". The remaining two students scored above the 80% mark, one earning a "B+" and the other earning a "B". An attitude survey conducted at the end of the semester showed that students enjoyed the course and felt that they had learned much about computers.

During the process of evaluating the program formatively and summatively, several strengths were identified, including the following:

1. Learners became proficient at applications that they would most likely be utilizing in the future.

2. Learners were ahead of most of their college peers, as well as many of their teachers, in computer literacy.

3. Several of the students took advantage of the discovery learning activities to teach themselves how to create sophisticated graphics and hypermedia presentations. A pair of students experimented with Authorware Professional, a powerful authoring system, to produce multimedia presentations.

4. Since instruction and assessment were based on validated objectives, there was little confusion as to what was expected of the learners.

5. Courses such as this one should, hopefully, make college-level basic computer applications courses obsolete.

Weaknesses observed included the following:

1. Some of the learners could type at a moderate rate of speed (over 35 words per minute) while others typed slowly (10-15 words per minute). This caused some delays during instruction. An assessment of this learner characteristic and some early tutelage in keyboarding skills would have been advisable.

2. More material could have been taught during the same period of time, including an introduction to spreadsheets or databases.

3. Teachers of the other courses in the school needed to be made more aware of educational applications of computers, including the integration of computers into the general school curriculum.

As a result of the project, the school decided to adopt the computer applications curricula and offer it to both seventh and eighth grades.

Integrating Computers Across the Curriculum

Early on in the project, it became apparent that the learners would be served much better if their computer skills could be utilized in other courses, such as English, foreign language, social studies, and science. Attempts at integrating computers across the curriculum were largely unsuccessful, due to two primary factors:

1. The teachers were not experienced or comfortable with classroom applications of computers.

2. The teachers were not aware of available computer applications and software in their field.

3. Integration across subjects is difficult and time-consuming. It requires a greater amount of planning and involves the coordination of assignments between teachers.

For teachers and administrators who are interested in enhancing the integration of computers across the curriculum, the following strategies have been implemented successfully:

1. Writing assignments can be given jointly by the computer teacher and subject area teacher. Assignments would include word processing mechanics and formatting (bolding, underlining, and cutting/pasting text, importing graphic images, centering and justifying text, generating automatic page numbers, changing margins, etc.) The computer teacher would grade according to the mechanics and formatting requirements, while the subject area teacher would grade according to the content of the assignment.

2. Teachers who find themselves without time or opportunity to review several educational software titles could have computer literate students review software for extra credit. The teachers would then review only the few programs highest rated by their students.

Conclusion

Conclusions reached as a result of the design, development, and integration of middle school computer applications curriculum included the following:

1. Computer literacy at an early age gives learners access to a very powerful tool. As computers are introduced to younger learners, it becomes necessary to train them initially in those applications that will be most useful to them. Computer curriculum should begin with common applications, rather than programming skills.

2. A course to upgrade keyboarding skills would be a valuable prerequisite to computer instruction.

3. Although many facets of computers can be covered in a course, the teaching of computers as a separate, non-integrated subject is akin to teaching a course in calculators or pencil usage. Only by integrating computers into other curriculum will the students be able to tap their potential.

4. Teachers (and teacher educators) must be better educated in the use of computers to assist in instructional, as well as administrative functions.

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